DOCUMENT RESUME

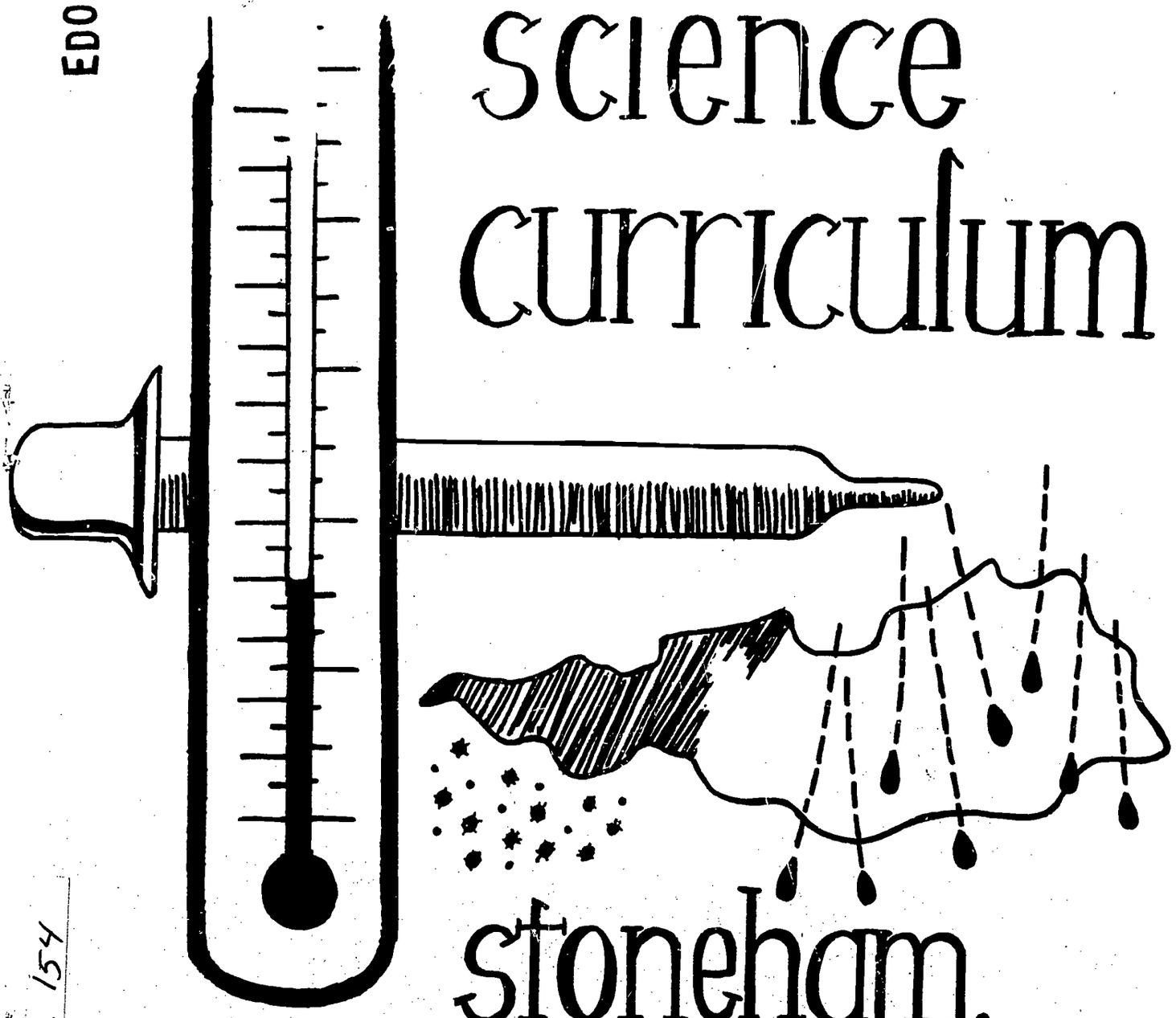
ED 052 996 SE 012 154

TITLE	Elementary Science Curriculum, Grade 2.
INSTITUTION	Stoneham Public Schools, Mass.
PUB DATE	[70]
NOTE	85p.
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	*Curriculum Guides, *Elementary School Science, General Science, Grade 2, *Instruction, *Laboratory Procedures, Science Activities, Scientific Enterprise, *Teaching Guides

ABSTRACT

This is one of a set of curriculum guides for the Stoneham Elementary School Science Program (see SE 012 153 - SE 012 158). Each guide contains a chart illustrating the scope and sequence of the physical, life, and earth sciences introduced at each grade level. For each of the topics introduced at this grade level, an overview of the topic, a list of concepts to be developed, motivating ideas, suggested activities to develop each concept, a reading list, a list of supplies needed, and examples of student work sheets are provided. In most activities, the teacher is expected to involve all students in experimenting and applying scientific thinking. The topics covered in the grade two guide are: animal structure, molecules, plant diversity and structure, animal diversity and structure, and fossils and evolution. (AL)

Elementary science curriculum



grade 2

stoneham, mass.

STONEHAM PUBLIC SCHOOLS
STONEHAM, MASSACHUSETTS

ELEMENTARY SCIENCE CURRICULUM GUIDE

GRADE 2

Superintendent of Schools	Michael Scarpitto, PH.D.
Assistant Superintendent	Daniel W. Hogan, Jr.
Administrative Assistant	Thomas L. Wilton
Supervisor of Elementary Education	Ruth E. Mayo

FOREWORD

These units were written as guides for the teaching of science. The activities suggested are given to assist the teacher in illustrating the given concepts. In some instances there are several activities, but the teacher may use only those which will best suit her class. In other cases the activities suggested follow a particular sequence which would encompass several days illustrating several related subconcepts along the way. It is not expected that the teacher stick rigidly to her curriculum guide. If deviating to include another concept, however, the teacher is advised to consult the other Stoneham Science Curriculum Guides to be certain that the concept is not introduced at another grade level. The teacher is encouraged to have reference materials in the class room at all times for each unit.

Whenever possible, the teacher is expected to involve all the children in experimenting and encouraging application of the scientific method and thinking. This would involve the following skills:

1. to formulate hypothesis
2. to reason quantitatively
3. to evaluate critically
4. to draw conclusions
5. to select procedures
6. to define problems
7. to create charts and keep records
8. to use equipment effectively

It is intended that the teacher will adequately adopt this guide to her own class needs.

Sue Hopkins---------Grade 1
Judith Bowen---------Grade 2
Bette Littman--------Grade 3
Carol Bearse---------Grade 4
Joan Knipping--------Grade 5
Linda Young----------Grade 6 Co-Chairman
Mary White-----------Grade 6 Co-Chairman

Table of Contents

	Page
Statement of Philosophy	1
Scope and Sequence Chart	2
Unit I - We Grow Up	7
Unit II -- Molecules	18
Unit III - Plants	36
Unit IV - Animals	54
Unit V - A Long Time Ago	73

STATEMENT OF PHILOSOPHY

We have all experienced the confusion of sorting out events that come at us, seemingly, haphazardly. We try to perceive the link, the relationship, that will make everything clear, that will help us decide. In fact, from the time we are born the main activity of our lives is trying to sense some order in our constantly changing world. Science is a tool that man uses to seek order. Modern science has evolved not only as a body of fact, but also as a logical approach to problem solving. In the elementary school this aspect of science should not be overlooked. The study of science should encourage growth in the ability to solve problems, as well as introduce a background of knowledge.

To achieve this goal the emphasis must shift away from the teaching of "facts" to the development of such abilities as: observation, collection of information, classification, formation of hypotheses, data interpretation,generalization, and prediction. Thus the process of learning becomes just as important as the information obtained.

This approach to teaching science transforms the classroom into a laboratory and the children into scientists working within it. The teacher provides enough orientation so that the children develop goals of their own, and guides them through concrete experiences that nurture both technique and knowledge of facts. There are many outcomes of a lesson: skills, facts, aroused curiosity,ideas, and discovery of new relationships. The pupils gain confidence in their own ability to learn, a process which will be valuable long after the facts are forgotten.

SCOPE AND SEQUENCE CHART

SCOPE AND SEQUENCE CHART

		GRADE I	GRADE 2	GRADE 3
PHYSICAL	Chemistry	Changes in Matter melting freezing heating	Changes in Matter solid liquid gas molecular	
PHYSICAL	Physics	Magnets push and pull		Magnets attraction repulsion Simple Machines their uses relationships of applied force
LIFE	Human Body	Growth bones teeth nutrition health	Growth muscles skeletal structure emotions	
LIFE	Plants	Reproduction seeds bulbs spores regeneration	Life Activities structure classification seed plants non-seed plants	Ecosystem pond community
LIFE	Animals	Classification vertebrates	Life Activities life cycle insects brine shrimp	

SCOPE AND SEQUENCE CHART

GRADE 4	GRADE 5	GRADE 6
Molecular Theory matter molecules energy - relations		
Electricity static-current production conductors **Sound** waves, vibration, pitch, reflection	**Heat** motion expansion-contraction conduction, convection insulators	**Light** photons-reflection waves color
The Ear producing and hearing sounds	**Cellular Organization** cells tissues organs	**Genetics** heredity genetic code dominant and recessive traits
		Photosynthesis leaf structure carbon cycle
Simple and Complex 5 basic life-processes cellular structure classification		**Animal Behavior** inherited and learned **Ecology** balance in nature disbalance

5

SCOPE AND SEQUENCE CHART

	GRADE 1	GRADE 2	GRADE 3
Astronomy E A R T H	Earth - Sun - Moon rotation day and night		Solar System orbits revolutions seasonal change
Geology		Fossils dinosaurs fuels evolution	Earth Composition soil rock formation classification
Meteorology	Changes in Weather clouds		Water Cycle cloud formation precipitation weather prediction

SCOPE AND SEQUENCE CHART

	GRADE 4	GRADE 5	GRADE 6
		Forces in Space centrifugal centripetal gravitational	**Motion in Space** movement of plants parallax, triangulation gallaxies atomic energy
		Earth Changes surface interior **Ocean Environment** water food life exploration	
	Influence on Man air ingredients of weather effects of weather		

We Grow Up

WE GROW UP

A. Background

All living things are made up of parts that work together. There is a relationship between structure and function. The structure of different parts determines their function. As we grow, these structures change, thus changing their function. An example would be our bones, which become harder as we grow older, thus changing their function somewhat. Our muscles also change. They can become firmer or softer, depending on their use. Thus, all structure and function is related in animals.

B. Concepts

1. The skeleton is made up of many parts, each with a different function.

2. Arm and leg movements are used in large body movements.

3. Wrist and finger movements are used in finer body movements.

4. Joints allow bones to move in various ways.

5. Muscles help supply the force to move the body.

6. Muscles move in pairs to produce different body movements.

7. Good food helps our body to develop properly.

8. Every living organism is different from every other organism, with each having different feelings.

C. Motivation

1. Write the word skeleton on the board and ask the class what it means. Have the class locate and name all the bones they know.

2. Ask a child to gring in two different photographs of himself at different ages. Ask the class to decide how he has changed in the two photographs.

D. Activities

CONCEPTS	EXPERIENCES
The skeleton is made up of many parts, each with a different function.	Materials: none Procedure: Have the class find different bones of their body . . . and decide how they are used - (skull, arms, legs, fingers, ribs, backbone).

Which are used for protection and which for movement?

EXTENSION

Have the class bring in different bones (chicken, ham, turkey.) Point out their relative strength. Can they be used for protection or movement?

Arm and leg movements are used in large body movements.

Materials: pictures of kangaroo, rabbit, frog.

Wrist and finger movements are used in finer body movements.

Procedure: Have the class decide which bones can hold a great deal of weight. Which bones appear to be stronger? Which bones aid in dexterity? Have the class decide what the bones in these legs enable the animal to do?(kangaroo, rabbit, frog.) The children should be able to describe the movement of a cat's tail and decide whether the bones are large or small in the tail.

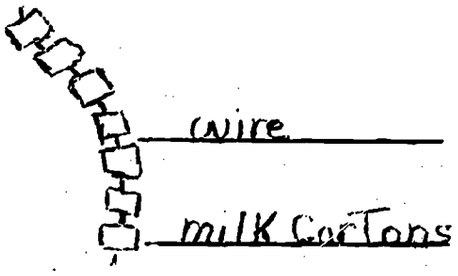
EXTENSION

Make a model of a backbone. Place milk cartons on a wire. Which can move more ways, a stick or the "backbone"? Why? Are the bones of the back all large or small?

Joints allow bones to move in various ways.

Materials: hinge

Procedure: Show the class the hinge and have them decide if they have any bones that move the way a hinge moves. Explain that when two bones come together they form a hinge which we call a joint. Have the class move their arms and legs and see if there is any other way two bones can move. Show how a "ball and socket" joint operates.



EXTENSION

Arrange an exhibit of mechanical models of joints and have the class label them.

Muscles help supply the force to move the body.

Materials: hinged door and two elastic bands

Procedure: Have a child move the hinge on a door. Explain that although the hinge will bend, the child's force is needed to move it. It will not move by itself. Have the class feel their arms. Have them flex and straighten them. Explain that there are tendons at the end of each muscle and ligaments which hold the muscle in place. When we make our arm bulge, is there more stuff in it? (No) Have the class pull on two elastic bands. What happens? Explain that muscles work in pairs.

Muscles move in pairs to produce different body movements.

Materials: Rubber bands (2), pegboard.

Procedure: Have the class make rubber band models of muscles. Stretch a rubber band between two nails on a pegboard. Attach the other but don't stretch. Have the children write labels to describe each--"long and thin," "short and thick."

All organisms depend on food substances for growth and energy.

Materials: Ruler

Procedure: Have a child in the class measure several children in the room. Have the class decide whether they are all alike or different. Have they grown any since first grade? Discuss what would happen if you didn't cut your hair or nails. Have the class decide what has made them grow.

EXTENSION

1. Using the school health records, write each child's weight last year under his weight this year. Give the paper to the class and ask them to compute the weight they have gained or lost.

2. Arrange an exhibit of clothes, toys, and photographs of the children when they were babies and now.

3. Make pictures showing how the class looked in first grade and how they look now.

4. Discuss with the class why they can run faster now than they could a year ago. What has helped them to run faster? (They have grown.) Decide the use that food plays in growth as a "fuel."

5. Have the school nurse give a discussion to the class about good food as related to repair of body parts, and safety and first aid.

6. Prepare a bulletin board on the seven basic foods, having the class cut out pictures. Discuss the foods we should eat at each meal.

7. Have each child make a booklet of foods for growth.

8. Draw pictures of three good meals that the children could eat in one day.

9. Have the class make a three-dimensional bulletin board on food.

ENRICHMENT

Emotions

A. Background

Our emotions are changing every day of our lives. We feel fear, love, hate, anger and many other emotions in the course of each day. Children are aware of these emotions but not why they occur. They understand that something has changed in their environment but they are not sure of what or why. For these reasons, this section has been included in hopes that it might help children better understand the behavior of themselves and those around them.

B. Concepts

1. The natural feeling of fear is shared by everyone.

2. People fear different things, but it is important to be able to distinguish between things that are truly dangerous.

3. Fear often comes from lack of understanding.

4. People are often afraid of what others will think of them.

5. Everybody gets angry at times.

6. There are many reasons why people get angry.

7. Some people find it difficult to learn how to lose.

C. Motivation

Show the class pictures which express different emotions. Discuss what these emotions are and ask the class to think of other emotions.

D. Activities

CONCEPTS	EXPERIENCES
The natural feeling of fear is shared by everyone.	Procedure: Discuss with the children how they have felt when they have taken rides at an amusement park. Why have they felt the way they did? Were they afraid or excited? Explain that we learn to fear things and there are some fears which have no basis. Discuss what happens to our body when we have strong feelings. EXTENSION Have the class draw pictures showing what they are afraid of.
People fear different things but it is important to be able to distinguish between things that are truly dangerous. Fear often comes from lack of understanding.	Procedure: Using the pictures the class has drawn, ask the class to decide which things they should be afraid of and which things they should not be afraid of. Decide whether the fear shown is based on a rational belief or on lack of understanding. EXTENSION Make a list, with the class, of fears that help keep us alive.
People are often afraid of what others will think of them.	Procedure: Discuss with the class some dangerous things that they might have done because they were afraid of what a friend might say about them. Were they afraid at the time? Then, why did they do it?
Everybody gets angry at times.	Procedure: Act out a dare between two children. If one of the children reacted angrily call attention to the consequences. Re-enact the scene without emotion.

There are many reasons why people get angry.

Procedure: Discuss why each behavior got the response it did. Was the person hungry or tired? Discuss things that make the boys and girls become angry, (being pushed on the playground may well be one.)

EXTENSION

Make a list of constructive means of releasing anger.

Some people find it difficult to learn to lose.

Procedure: Discuss with the class what happens when someone stops playing a game because he is not winning. What do the other children say about him - to him? Explain that whether we are the winner or loser, we must be considerate of others. What effect does tone of voice have? What can we do to help?

EXTENSION

1. Make a chart showing how to be a good winner and a good loser.

2. Field trip to the Museum of Science in Boston.

Vocabulary List - We Grow Up

bones

skin

muscles

finger

wrist

arm

leg

skeleton

backbone

joint

ball and socket

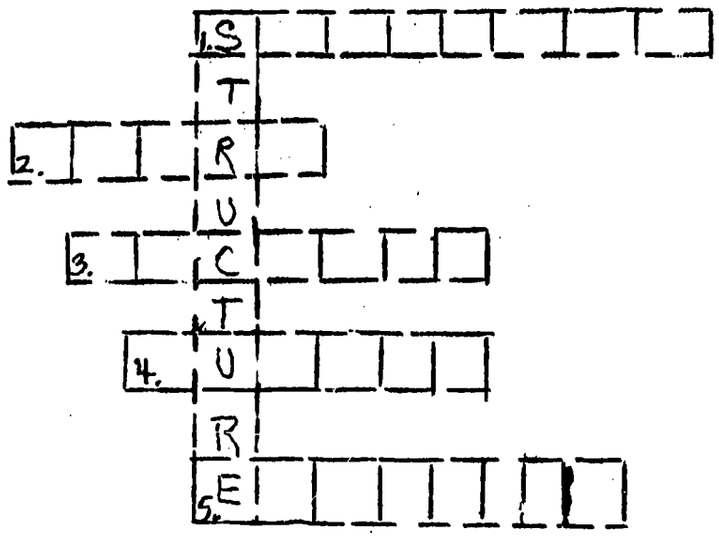
hinge

skull

ribs

Worksheet Ideas: We Grow Up

1.



1. Another word for frame is _____.
2. Muscles work in _____.
3. Man has a _____to hold him up straight.
4. Our _____help us do work.
5. Our _____make us feel angry, sad, or afraid.

2. Scrambled words.
   a. smsulec
   b. ojntis
   c. rwsit
   d. nefigrs
   e. keeltsno

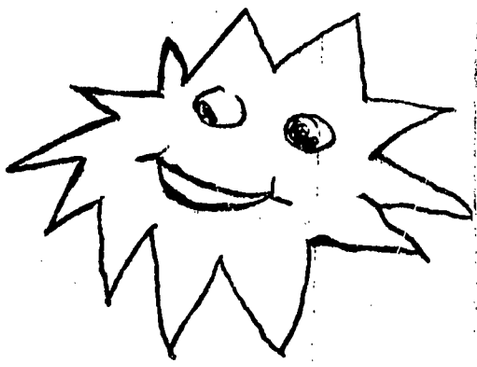
3. Fill in the right word.
   a. We need _____for good health.
   b. Our _____work in pairs.
   c. Our _____are like hinges.
   d. Man depends on _____for food.
   e. When we are angry we sometimes show our _____.

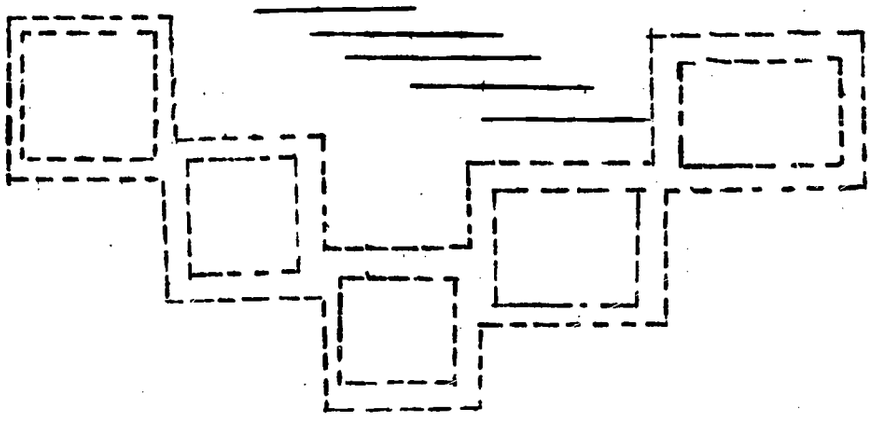
muscles, joints, food, plants, emotions

Bulletin Board Ideas - We Grow Up

GOOD MORNING !

Did you have a good BREAKFAST?





BIBLIOGRAPHY

Teacher's Books

Brandwein, Paul E. - Concepts in Science 2, Harcourt, Brace & World, Inc. 1966

Craig, Daniel - Science For You, Book 2, Ginn & Co., 1965

Jacobson, Willard J. - Food, American Book Co., 1965

Jacobson, Willard J. - Searching In Science, American Book Co., 1965

Mac Cracken, Helen D. - Science Through Discovery 2, L.W. Singer Co., Inc. 1968

Novak, Joseph - The Exciting World of Science, Bobbs-Merrill Co., Inc., 1966

Smith, Herbert A. - Science 2, Laidlaw Brothers, 1966

Children's Books

Selsam, Millicent - When An Animal Grows, Harper & Row, Publishers, 1966

Bothers, Ray - How Does It Grow? St. Martin's Press, 1963

Georgion, Constantine - Whitey and Whiskers and Food, Harvey House, 1964

Neurath, Mary - Many Foods, Sterling, 1963

Urdy, Janice May - Betsy - Back - Bin - Bed, Albert Whitman & Co., 1963

FILMSTRIPS

Cereals	1-3-C2
Vegetables	1-3-C3
Fish	1-3-C4
Dairy Products	1-3-C5
Meat	1-3-C4
Bread	1-3-C6
Eggs	1-3-C7
Milk	1-3-C8
Fruits	1-3-D1
How Your Body Grows	1-5-B4
Your Muscles	1-5-B2
Your Bones	

Molecules

MOLECULES

A. Background

In this unit an understanding of the structure of matter should be developed. The children will handle and observe familiar materials and objects, and use their senses to detect things too small to be seen. They will become aware that substances are composed of molecules, and that molecules are the smallest substance which retains the chemical properties of that substance. From this point, they will discover that molecules are continuously in motion; that heat energy determines the rate of molecular motion; and the rate of molecular motion determines the state of matter; and that the motion of molecules can be used to do work.

B. Concepts

1. A molecule is the smallest part of a substance which retains the chemical properties of that substance.

2. Although molecules are too small to be seen, they may be detected by other materials.

3. Molecules are too small to be seen, but substances can be determined by the sense of smell.

4. Molecules can sometimes be detected by the sense of taste.

5. Molecules of one substance can be diffused with molecules of another.

6. Molecules of one substance may be evenly dissolved through molecules of another.

7. The motion of molecules determines the state of matter.

8. Every substance has its own particular molecular structure, which is determined by the kinds, number, and arrangement of atoms within a molecule.

9. Evaporation results when molecules gain enough energy to move apart from one another.

10. Heat energy causes water to expand.

11. Expansion exerts a force that can be used to do work.

12. Heat energy causes air to expand.

13. Heat energy can be transferred from one place to another by molecular collisions.

14. Heat energy causes matter to expand.

15. The temperature of a body increases with an increase in the speed of the molecules.

16. Expansion results when molecules move faster.

C. Motivation

Open a bottle of perfume or ammonia in the classroom. Ask the children what the substance is. Keep the bottles out of view so that they must use their senses to determine what the smell is. Ask the children how they know what things are without seeing them? As for examples. Explain that we are going to find out how we know what these things are although we can't see them.

D. Activities

A molecule is the smallest part of substance which retains the chemical properties of that substance. Although molecules are too small to be seen they may be detected by other methods.	Materials: Bring in a variety of strong smelling substances: onions, perfume, ammonia, mint, soap. Procedure: Ask the class to identify each substance without being told or shown what they are. Help them to understand that we can smell only when something reaches the nose. Discuss food smells and how you know what your mother is cooking without being in the room.
Molecules are too small to be seen, but substances can be determined by the sense of smell.	Materials: An atomizer or spray with perfume or cologne Procedure: Spray across the room. Ask someone at the back to raise their hand when they can smell it. Decide what has been smelled and where. Ask the class questions similar to these: What happened when the perfume came out? (tiny drops could be seen for a second or two, then they changed into smaller parts.) What happened to the smaller parts? Through discussion, lead the children to the following understandings:

a. When air is sprayed, the small parts of the perfume mix with the air.

b. We smell perfume when some of the smallest parts reach our noses.

c. The smallest parts of perfume are too small to be seen.

Extension: Make a collection of substances that can be recognized by smell.

Molecules can sometimes be detected through the sense of taste.

Materials: cube of sugar; magnifying glass, water

Procedure: Have the class examine a cube of sugar with a magnifying glass. Break up a cube of sugar and use a magnifying glass to look at the grains. Ask the class if these are the smallest parts of sugar. Place the sugar cube in water. Use the magnifying glass to determine if sugar particles can still be seen. Sugar particles should no longer be visible. How can you tell the sugar molecules are still present in the glass? Have someone taste the water. Can a sugar molecule be tested? Help the children understand that a molecule is the smallest part of sugar and that it is so small it can't be seen.

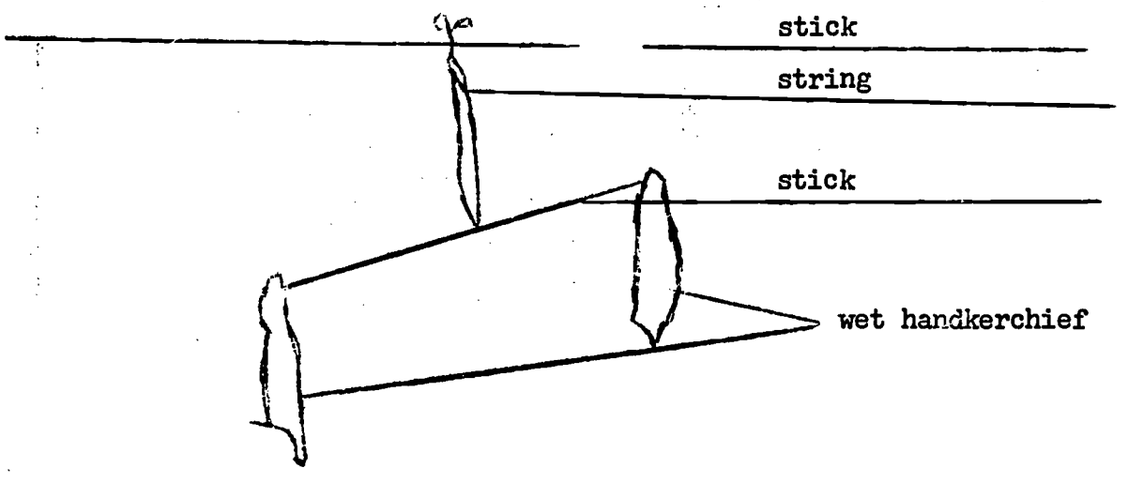
Extension: Using a transparent cup, a sugar cube and a magnifying glass, watch a sugar cube dissolve. Tiny air bubbles will rise from the cube to the surface; without being touched, grains of sugar break from the cube and move into invisibility. Motion in the water causes spiraling waves of partially dissolved sugar. These can best be viewed toward the light.

Molecules of one substance can be diffused with molecules of another.

Materials: mirror, wet cloth, 2 handkerchiefs, 2 sticks and a string.

The aim of this lesson is for the children to recognize that water evaporates when its molecules move into and diffuse with the air. Have someone breathe on a mirror. Decide what you see. (water droplets.) What happens to them? Make a wet spot on the chalk board with a cloth. When the spot disappears ask the class what happens to water when something wet gets dry?

Fasten two dry handkerchiefs to the ends of rod by tying a corner of each handkerchief around the rod or by tying the corners on with small pieces of twine. Second, tie an end of twine to the middle of the rod. Third, support the balance rod by the twine. Attach the twine to any support that allows the rod to hang free. Fourth, move the twine on the rod back and forth until the rod is balanced.



Make sure the children understand that the rod balances because it is as heavy on one end as on the other.
Being careful not to change the balance, wet one of the handkerchiefs. Squeeze out excess water. One side of the balance is now lower than the other. Why? Ask the class what will happen when the handkerchief gets dry? Why will the rod balance when the handkerchief gets dry? Where does the water go? Explain that a molecule of water is the smallest part of water. Can they see a molecule of water? Where are the water molecules when the handkerchief is wet? What happens to them after the handkerchief is dry? Explain that the handkerchief dries because the water molecules do not stay in the cloth. They escape and go into the air. They become water vapor, which we cannot see, taste or smell.

Molecules of one substance can be evenly dissolved through molecules of another.

Materials: sugar, cup of water, wide shallow dish, ball of cotton, straw.

Procedure: The aim of this lesson is for the children to discover how sugar dissolves in water and how it is recovered as the water evaporates. Place two teaspoonfuls of sugar in half cup of water. Have someone taste the solution. Pour the water through the ball of cotton. Have the "tester" sip the solution again. Did the sugar go through the cotton? Point out that the molecules must be very, very tiny to pass through the cotton. Place the solution in a wide shallow dish. Ask the class what will happen to the water? It should evaporate. Decide what will remain behind after all the water has evaporated. Check this by leaving the dish to allow the water to evaporate.

Extension: Using the sugar crystals left behind, allow someone to measure the amount left. It will be approximately the same as the amount started with. Sugar does not evaporate.

Every substance has its own particular molecular structure, which is determined by the kinds, number and arrangement of atoms within a molecule.

Materials: granulated sugar, chalk dust

Procedure: The aim of the lesson is for the children to discover how models and other symbols may be used to represent molecules. Review what molecules are. Using a spoonful of granulated sugar and a small amount of chalk dust (each should be placed on dark paper), ask how we might look at a single grain of sugar. Someone will probably suggest a magnifying glass or a microscope. Have someone make a drawing of what he sees through the microscope. Explain that what they have seen is giant size compared with molecules. Help the class speculate about what a molecule might look like. Explain that since we haven't seen a water molecule, we are using our imagination. Show the class four different representations of a rabbit, a photograph, a drawing, a model, the word "rabbit". You might then ask them to make a model of something they imagined. Explain that scientists use their imagination to make models of molecules, because they have not seen what molecules look like.

Extension:

1. Make models with toothpicks, gumdrops, Tinker Toy parts, from pictures seen in books.

2. Make solutions of each of the following; sugar, salt, Epsom salts, alum, boric acid. Use very hot water. Allow the children to observe what happens as the water cools and evaporates. Crystals will be left behind which can be viewed with magnifying glasses.

Evaporation results when molecules gain enough energy to move apart from one another.

Materials: mothballs, 4 glasses (one with a cover)

Procedure: Review the experiment done with the wet handkerchiefs.
Place water in a glass. What will happen to the water eventually? Where did the molecules of water go? Explain that as long as the molecules stay close together, the water remains a liquid. As the molecules spread further apart, the water changes to gas(water vapor). Hold up several mothballs. Ask the class how they know they are mothballs. (the smell) Molecules of camphor are excaping into the air. Decide whether camphor is a solid, liquid, or a gas. (A camphor ball is a solid until it evaporates and becomes a gas.) The molecules are close together. Both the water and the camphor show evaporation. They are different in that the water is a liquid and the camphor a solid. Set up the following experiment to investigate the evaporation of camphor. In four glasses place each of these: one mothball, five mothballs, one crushed mothball in an open glass, and one mothball in a closed glass. Make a note of the day the experiment is begun. Find the answers to these questions: from which glass does the solid camphor disappear completely? From which does it disappear most slowly? Will the camphor ball in the closed jar ever get any smaller? Does any of it evaporate?

Extension: Have the class find out how and why camphor is used in the home.

Heat energy causes water to expand.

Materials: pyrex pot with lid, hotplate.

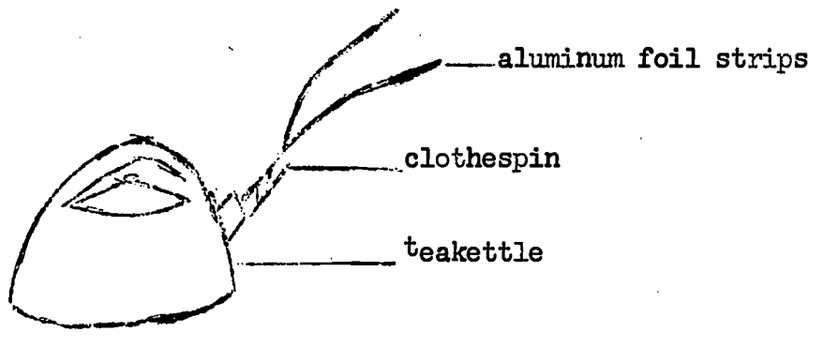
Expansion exerts a force that can be used to do work.

Procedure: Fill a pyrex pot half way with water. Help the class to understand that the rest of the pot is filled with air and likewise the outside surrounding the pot. Ask what will happen when the water boils? Place the uncovered pot on a hot plate and heat to boiling. Guide the children in observing tiny air bubbles which collect around the sides of the pot, and the first big bubbles of gas that form in the hottest part and rise to the surface. When the water boils vigorously, lay an aluminum pie plate on top of the pot and let the children watch the lid as it is pushed up by the escaping steam. Encourage discussion with the following questions: Where did the heat come from to make the water boil? What were the tiny, tiny bubbles that came out of the water before it boiled? What does water change to when it evaporates? (We call this water vapor steam.) We can say that the big bubbles are made of water vapor, or we can say they are made of steam. They form as the water changes to gas. Can you see the bubbles after they leave the water? Why can't you see them? Can we ever see water vapor? Since steam is another name for water vapor, can we see steam? (We see a tiny cloud outside of the steam. The steam condenses when it hits the colder surrounding air. Steam is an invisible gas.) When water changes to steam, is there enough room for it in the pot? How do you know that steam takes up more room than the boiling water did? Evaluate the children's understanding by asking them to imagine what would happen if a lot of water boiled in a pan with a tight-fitting lid. What would the steam do? The steam would blow the lid off because there would not be room enough inside the pan for all the steam. This is the first step in teaching children that expanding steam can do work in engines.

Materials: teakettle,hot plate, clothes pin, aluminum strips, 2 pins

Procedure: Place a teakettle on to boil. While it is heating review the concept of steam: What has been changed into steam? Why is the water changing to steam? Is steam a gas that we can see?

Take two clothes pins, one should have two aluminum foil streamers, each a foot long and about ½" wide, thumbtacked to the head; the other should have a pin wheel attached to the end. These should be placed on the spout of the teakettle <u>before it starts to boil</u>.



Notice that steam pushes out of the kettle and goes into the air. This steam moves things.

<u>Extension</u>:

1. Have the class examine a whistling teakettle at work.
2. Place marbles in the bottom of a shallow box with an opening out in one side. Call these marbles molecules. Show the children what happens when the molecules move farther and farther apart. As the spaces get bigger, more molecules are forced to leave the box.

Heat energy causes air to expand.

Materials: balloon, tonic bottle, pan with water, hot plate

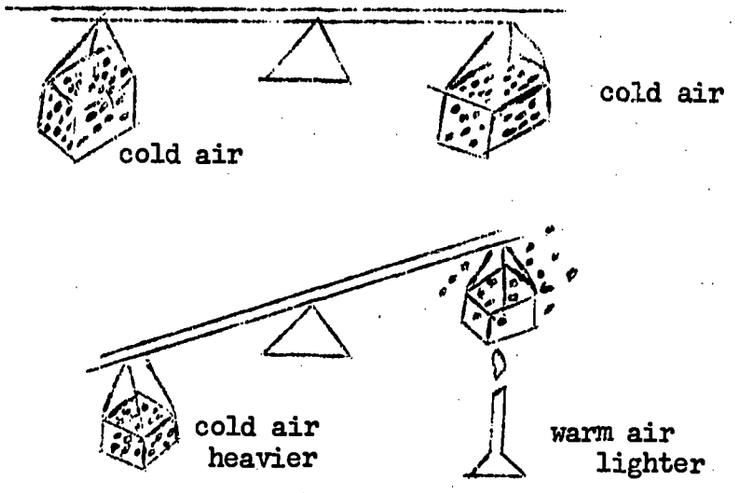
Procedure: Review what happens when water boils. Ask what happens when air gets hot. Use an empty tonic bottle to determine that there is air inside as well as outside the bottle. Place a balloon over the top of the bottle. Heat the bottle in a pan of water. Discuss what happens to the balloon. (The balloon fills up as the air heats up.) Explain that molecules of air filled the bottle. When the bottle was heated, the molecules moved faster and expanded, going into the balloon.

Extension: Bring a jar with a screw top which is on tight enough so that no one in the class can remove the top. Hold the top under hot water until it can be unscrewed. Explain that the heat causes the metal top to expand and thus become loose.

Heat energy can be transferred from one place to another by molecular collisions.

Materials: aluminum pie plate, heating element, two chalky erasers, electric light

Procedure: Invert an aluminum pie plate over a heating element. While this is heating, ask the class what is becoming hot besides the pan. Clap two chalky erasers over the pan. Is the air going up or down? Discuss with the children what happens to smoke in a fireplace. Use an electric light which may be plugged in. After it has been lit for a while, ask the class to feel the air around the bulb. Explain that the heated bulb has heated the air around it. The molecules are warmer and moving faster and bump into one another more frequently. Review the concept that hot air rises by the following illustrations:



It is important that the children understand that the rod on the right does not balance because one end is heavier than the other end.
Additional information to be presented:

a. A molecule has weight.
b. Something is heavier if it weighs more, and lighter if it weighs less.
c. The heavier end of the balance is pulled down by gravity.

Extension: Bring in a number of balloons and allow the children to blow them up. Toss the balloons around and observe that the only time the balloons go up is when they are tossed and they always come down again. Ask the children to describe balloons they may have seen go up. Have the class find out why this is so. (They are filled with a gas lighter than air.)

Heat energy causes matter to expand.

Materials: electric iron, ice cubes

The greater the speed of the molecules, the greater the temperature of the body.

Procedure: Review the fact that all substances (solids, liquids and gases) are composed of molecules. Review also that molecules move when water evaporates and air is heated.
Explain that molecules are constantly in motion but that heat causes them to move faster.
Use an electric iron and some ice cubes to help the children gain these understandings: In hot steam, the molecules move very fast. In cold ice, the molecules move slowly. In a cold iron, molecules move slowly. Energy from electricity makes the molecules move faster. In a hot iron, the molecules move very fast.

Extension: Secure a screw with a large head and a screw eye just big enough for the screw to pass through it. Screw each into the end of short lengths of dowel rod. About an inch of metal should be extending beyond the wood. Allow the children to screw the head in and out through the screw eye. Then heat the screw in a flame and try to put it through the eye. It will not pass through. If the screw eye is also heated, however, the screw will go through.

Expansion results when molecules move faster.

Materials: thermometer, two dishes of water

Procedure: Allow the class to examine and read the temperature on a thermometer. Explain that the thermometer shows the temperature of the air around it. Discuss what would happen if there were more heat in the room. If the room cooled off? How does a thermometer show the temperature of something? Why does the liquid go up and down in the tube? Use two dishes of water, one warmer than the other. Have someone try to tell the temperature by placing their hands in each dish. Use a thermometer to find

the actual temperature. Explain that the warm molecules move farther apart and thus cause the liquid to expand and move up the tube.

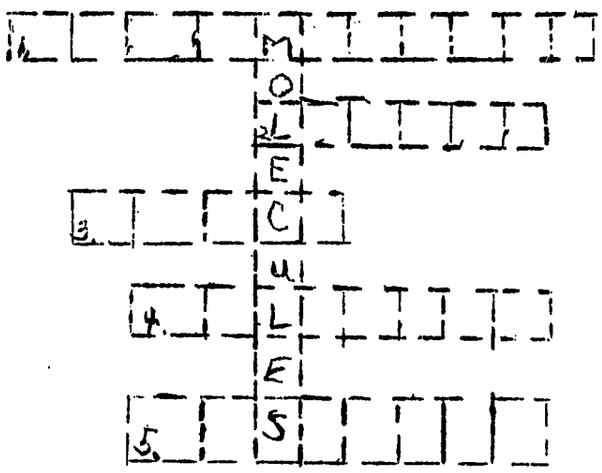
Extension: Begin a daily record of the outdoor temperature. Choose someone to read and record this on a chart. Explain the rise and fall of temperature in terms of heat from the sun.

Vocabulary List - Molecules

nose
senses
taste
touch
smell
sight
hearing
molecule
sugar
investigate
balance
water
watervapor
evaporate
dissolve
solution
solid
liquid
gas
model
drawing
imagination
boil
steam
heat
expand
air
weight
weigh
temperature
degrees
thermometer

Molecules - Worksheet Ideas

1.



1. We measure the temperature of the air with a _____.
2. Water is a _____.
3. We can not _____ molecules of air.
4. We can make a _____ of sugar and water.
5. When sugar is added to water, the sugar will _____.

2. Yes or No.

1. Cold air rises.
2. We can sometimes smell molecules.
3. Molecules are very small.
4. Wet things get dry when water evaporates.
5. We can see molecules.

3. Fill in the missing letters.

a. e__p_rat_
b. e_pa__
c. s__ut__n
d. _apor
e. __eam

4. Fill in the blank.

1. Molecules move _____when water foils.(slower,faster)
2. When water boils, water changes to _____.(steam,water)
3. A _____of sugar is the smallest part. (grain,molecule)
4. Molecules are too _____to be seen. (large, small)
5. Molecules move _____of the time. (all, none)

Bibliography

Teachers' Books

Barnard, J. Darrell. Science for Tomorrow's World. T.E. The MacMillan Co., 1966.

Brandwein, Paul F. Concepts In Science 2 T.E. Harcourt, Brace and World, Inc. 1966.

Freeman, Mae and Ira. Fun With Chemistry. Scholastic Book Services, 1944.

Jacobson, Willard J. Materials of the Earth. American Book Company, 1965.

Jacobson, Willard J. Fire and Temperature. American Book Company, 1965.

Jacobson, Willard J. Light and Heat. American Book Company, 1965.

Tannenbaum, Harold E. Heat. McGraw-Hill, Inc., 1967.

Tannenbaum, Harold E. Hot and Cold. McGraw-Hill, Inc., 1967.

Childrens' Books

Barnard, Jr. Darrell. Science for Tomorrow's World. The MacMillan Co., 1966

Brandwein, Paul F. Concepts in Science 2 Harcourt, Brace and World, Inc., 1966.

Branley, Franklin M. Reader's Digest Science Reader. Reader's Digest Services, Inc., 1963.

Filmstrips

Air in Action	3 - 3 - B5
Somethings Dissolve	3 - 5 - D1
Air All About Us	Robin Hood School
What Is Heat?	Junior High
Heat Changes Things	Junior High
Finding Out How Things Change	SVE
Finding Out About Heating, Solids, Liquids and Gases	SVE

Films

Heat and How We Use It	EBF
Things Expand When Heated	McG.
Water and What It Does	EBF

Plants

Plants

A. Background

The aim of this unit is to show the interdependency of all life. If an environment does not provide for an organism's needs, the organism will perish. However, an organism may survive as a poorly developed specimen if the environment is only partially adequate.

A second important aspect of this unit is to show that heredity and environment work together to produce all organisms. The seed will determine the type of plant to be formed. The heredity of the plant is determined in the seed. The environment this seed faces in its growing process may also help to determine the type of plant formed.

We will begin with a review of the differences between animal and plant life and the many different kinds of plants we see. We will then look at the parts of a plant and how they function. The next part of the unit will be concerned with the necessities of seeds and plants.

Finally we will spend time showing how man is dependent on plants, either directly or indirectly, for all his food.

B. Concepts

1. All plants and animals are products of heredity and environment.
2. There are many kinds of plants.
3. Plants are made up of different parts, each having a special function.
4. Seeds need good soil, warmth and light to sprout and grow.
5. A good place for one kind of plant may not be a good place for another.
6. Plants are directly or indirectly the source of all food for man and animals.
7. Green plants make their own food but many other types do not.
8. Different plants grow by different means.

C. Motivation

1. Make a field trip to a greenhouse.
2. Make a display of living and non-living substances, such as rocks, marbles, seeds, plants, etc.

D. Activities

CONCEPT	EXPERIENCE
All plants and animals are products of heredity and environment.	Materials: Pictures of many different kinds of plants
There are many kinds of plants.	Procedure: Have the children examine these pictures and determine how these plants are all alike. When this is done, ask the class to determine how they are all different. Help the class to chart these similarities and differences. Extension 1. Make a chart showing how plants and animals are similar and dissimilar. 2. Make a display of different kinds of plants. 3. Take a nature walk. Ask the class to notice all the different plants they see. Have the class draw pictures of as many as possible when they come back to the classroom.
Plants are made up of different parts, each having a special function.	Materials: You will need some plant parts such as, leaves, stems, flowers, a carrot with rootlets and hairs still attached; a weed or a tuft of grass, a complete stalk of celery; a geranium or other flowering plant. Procedure: Place these on a shelf or table and allow the children to examine and discuss them. Ask where the roots, leaves, stems, etc. came from. As the children name each part, write its name on the board. Through appropriate questioning, guide the class to these understandings: A flowering plant has roots, stems, leaves and flowers. The roots grow downward and spread out in the soil. The stems grow upward and spread out above the ground.

The leaves, which are green, grow out from the stems.

The flowers, which may or may not be brightly colored, also grow out of the stems.

Roots have special functions.

Materials: radish,seeds, two glasses or transparent plastic jars with walls lined with blotting paper; some water

Procedure: If necessary, briefly review the parts of a flowering plant. Choose a couple of careful workers and help them with the following procedures:

a. Fill the blotter-lined jars with water. Allow the water to remain in the jars until the blotters become thoroughly soaked. Then pour out all the water.

b. Place radish seeds between the blotter and the wall of each jar. Seeds should be about an inch apart and an inch and a half below the top edge of the blotter. Keep the blotting paper in two radish-seeds jars always damp by having a small amount of water at the bottom of each jar. As soon as the radish sprouts show a good root growth (several days) turn one of the jars on its side. After the top roots have changed direction, stand the roots upside down till the roots again point downward. Then turn the jar on its other side, and finally back to its original position. By continuing to move the jar, it is possible to cause the roots to grow in a circle as they continuously grow downward regardless of the position of the jar. The children should be guided to the following understandings by having completed this experiment.

Roots absorb water from the soil.

The absorbed water moves through the roots and up to the stem.

Roots anchor the plant in the soil.

Extension

1. Encourage the children to bring in samples of root vegetables: carrot, turnip, beet, radish. Ask the class not to clean the vegetables first as cleaning may remove the root hairs. Keep the vegetables between folds of damp paper toweling and let children take turns examining the root hairs through a magnifying glass.

2. To show that new stems and leaves can grow from part of a root, place a slice from the top of a beet, carrot, or turnip root in a pan of wet gravel. New green growth will form as a complete plant grows from the old root. A yam or sweet potato with wide end placed in water will grow stems and leaves and become a handsome plant for the classroom.

Stems have special functions.

Materials: red ink, liquid food color, a knife and several stalks of celery with leaves

Procedure: Help the children to identify the stem and leaves of the celery. A "bunch" of celery might be useful at this point to show where the roots would grow. Explain that the experiment we are going to do shows the important job done by the stem. Cut the bottom of the celery obliquely and immerse it in the red ink. If the celery is kept in bright sunlight for a few hours, the red color will show clearly in the stem and perhaps even in the leaves. Without bright light, the liquid will rise more slowly. A magnifying glass will help the children make the following observations:

There are many "strings" that go upward in a celery stem.

Each of the strings is really a very thick tube or pipe.

The red liquid goes up the tubes in the stem and out to the leaves.

Water travels from the roots in the soil to the stems.

The stems carry food to all parts of the plant.

As soon as the celery has become quite red, remove it from the ink. Pull off several "strings" and let children examine the ink-filled tubes. Then cut the stem into cross-sectional pieces and distribute them around the class. Encourage the class to examine these.

Extension

Make strong blue, green and yellow solutions from liquid food color. Take a wide stem of pale celery and make three lengthwise cut, stopping just short of the leaves. You now have a three-fingered stem topped with leaves. Spread the fingers apart, trim the bottom of each with an oblique cut, and leaves should be tri-colored. Encourage the children to explore with various kinds of stems, leaves, and flowers.

Green leaves make food for the plant.

Materials: various kinds of green leaves, some of which should be attached to their stems. If there are a few green leaves available outdoors at this time of the year, use some of the following: beet, carrot, turnip, radish or celery tops; leaves of lettuce of spinach; leaves from house plants

Procedure: Arrange the leaves on a shelf or table and give the children time to examine and handle them. Guide the children's observations by asking them to notice the differences in size, shape, texture and shade of green. Help the children to express ideas like these:

Leaves are green.

A leaf makes food for the plant.

In a leaf, energy from the sun is used to change materials from water and air into food for the plant.

Evaluate the children's comprehension of the function of leaves by presenting some problems for discussion.

If all the leaves were cut off a green plant, could it live long? Why not?

Why can a green plant not grow in the dark?

Why can a green plant not make food if it gets no air or water? If plants could not manufacture food, what would we have to eat?

Extension

Encourage children to collect and study different kinds of leaves. Press specimens between magazines. When the leaves are flat and dry, help children to mount them on sheets of drawing paper.

Flowers produce seeds.

Materials: several flowers, fruits, and their seeds, such as: peach blossom, peach and seed; bean blossom, bean and seed; cherry or apple, etc.

Procedure: Review the parts of a plant. Allow the class to examine these. Ask the class to think about an apple tree. What have they seen first on the tree, the blossom or the apple? Through discussion, help the children to understand that flowers bloom on the tree in the spring. After a while the petals fade and fall off the tree. The bottom part of the flowers, however, stays on the tree. In this part, a seed grows. At first the seed is covered by a little hard, green ball. As the seed grows, its covering grows, too, and becomes a ripe apple. Try to make sure that all children understand that the fruit with the seed inside comes after the flower. Children should reach the following understandings:

A flower produces seeds.

Fruit grows around the seeds that are made in the flower.

Every kind of seed plant has its own kind of seeds enclosed in its own kind of fruit.

A seed can grow into a new plant of the same kind as the plant from which it grew.

A few questions, such as the following, might be presented to emphasize the flower's dependence on its environment:

Suppose there is no water in the soil? Can a plant grow flowers in such a soil? Why not? Can a plant develop flowers if no light shines on its leaves? Why not? Why does a flower wilt and die when it is picked and the stem is not put into water?

Extension

1. Have the class bring in different kinds of seeds. Break these open and find the new plant and its food.

2. Encourage the class to bring in different kinds of seeds which can be planted in the class. Label each and help each child to keep a progress chart of how his plant grows.

Seeds need good soil, warmth, and light to sprout and grow.

Materials: two pots of sandy soil, two pots of claysoil, two pots of loam, sunflower and pumpkin seeds.

Procedure: Review from first grade the need of plants to be in sunlight. Guide the children toward the understanding that plants also need good soil to grow by doing the following experiment.

1. Plant five sunflower seeds in one pot of sandy soil. Plant five pumpkin seeds in the other pot of sandy soil. Plant them just as deep as you did the sunflower seeds. Label each pot.

2. Do the same thing with the pots of clay soil and loam.

3. Put the pots where they will have sunlight.

4. Give all the pots of soil the same amount of water each day.

5. Observe the growth of each plant and chart its growth.

Extension

Make a picture story. Show how the plants in each pot grew and changed.

A good place for one kind of plant may not be a good place for another.

Materials: some fresh seaweed and a water lily, a cactus and a bean plant.

Procedure: Encourage the class to observe and discuss these plants. Let them determine how they are all alike and yet all different. Guide them to the understanding that although they are all plants, they do not all live in the same type of environment. To determine what would happen if these plants were placed in another kind of environment place each type of plant in salt water, fresh water, land and desert climates. You can use four boxes and similate a climate for each type of plant. Record the results. Which plants live in which climates?

Extension

If the materials are available, you could develop a woodland terrarium and a swampland terrarium. Observe the differences between the two climates. Directions for both types of terrariums may be found in the Teacher's Manual for Living Things by Harold E. Tannenbaum. The directions for setting up a woodland terrarium may also be found in the 3rd grade curriculum guide for science.

Plants are directly or indirectly the source of all food for man and animals.

Procedure: Ask the children to name plants or parts of plants they ate yesterday. Through discussion develop the idea that a great proportion of our daily food consists of plant materials. Review the parts of a flowering plant. Have the class find pictures in magazines of plants. Once these are collected allow the children to observe and discuss them carefully. Through discussion and study of the pictures, children should reach the following understandings:

We use many kinds of plants as food.

We eat different parts of different plants.

We eat roots, stems, leaves, flowers, seeds and fruits.

Encourage the class to find pictures of animals feeding. Discuss what these animals are feeding on. In every case there will be a link directly or indirectly with plants. Help the children to understand that many farm animals use plants as food. Many other kinds of animals also use plants as food.

Extension

1. Suggest that children bring in well-washed cans, cardboard cartons, and frozen food packages (with labels intact) for a display illustrating the theme: "Plant parts we eat." Let the children classify the exhibit to show foods from roots, stems, leaves, flowers, fruits, and seeds.

Have children wash hands well and place a small clean piece of paper toweling on their desks. Give each child samples of different kinds of fruits, strawberries, raspberries, black mulberries, or other small edible fruits. Help the children to be aware of the variety in fruit-seed arrangements. Some fruits, like cherries, peaches, and plums,

hold a single seed within. Some, like strawberries, have seeds on the outer surface.

3. Make papier mache' models of plants that we eat.

4. Make a diagram showing how animals need plants to live.

5. Ask the children whether or not an African lion that catches a grass-eating zebra and feeds on it is dependent on plants for food. Have pupils explain their answers.

6. Make a display of clothes that are made from plants.

Green plants make their own food but many other types do not.

Materials: Mushrooms

Procedure: Review what was learned in first grade concerning the need for sunlight in growing plants. Help the children to understand that the sun helps the plant make its own food.

Explain also that there are other plants which cannot make their own food. They get their food from other things living and non-living.

At this point you will need some mushrooms. Allow the class to examine and discuss them. Guide the class toward the understanding that mushrooms are not green plants and therefore cannot make their own food. The children should be able to tell where they have seen mushrooms growing before. Emphasize that mushrooms should not be eaten unless identified as edible by an expert. Encourage the children to examine the mushrooms carefully for a fruit or flower. If there are no fruit or flower how does the mushroom make new plants? Break open the cap of the mushroom. Have the children note the large quantity of spores. Examine them with a hand lens. Guide the children to the following understandings:

You are most likely to find mushrooms in warm, damp weather.

Mushrooms get their food from the soil or decaying logs.

Mushrooms are a kind of fungus (i) and belongs to the same family as molds.

Extension

Grow bread mold.

Expose some moistened bread and some dry bread to the air for several days. On which does mold begin to form first? Bread mold needs moisture to grow; bread molds form more readily in humid weather. Expose two slices of moistened bread for 24 hours. Then put one slice in a refrigerator. Observe the rate of growth of the mold on each slice.

Different plants grow by different means.

Materials: onion, water

Procedure: Review how seed plants grow. Explain that not alll plants grow this way. You will need an onion that is beginning to sprout, as a example of a bulb. Cut the onion open. Have the children identify the part that will grow. Grow an onion in water for a time. Explain that this will eventually have to be transferred to soil if it is to continue to grow.

Extension

Plant bulbs in a container with pebbles, a few bits of charcoal, and water. The children can feel the bulb from time to time to see how its volume diminishes as the new plant sprouts.

Materials: You will need cuttings from a geranium, coleus, begonia, philodendren or ivy. Do not have too long a cutting or the plant will have too many leaves to be supplied with water.

Procedure: Put the cutting in water and leave it there until small root hairs develop. When a root system is plainly visible, the new plant may be put in soil. Guide the children to the understanding that plants may also be grown from "cuttings" of another plant.

Extension

1. Cut a potato (containing buds) into three pieces. Place one piece on wax paper, one in soil, and one in water. Record the results.

2. Draw pictures showing the different ways plants may be grown.

Vocabulary List -- Plants

root

stem

leaves

flower

leaf

geranium

trunk

branch

roothairs

petal

seeds

bulb

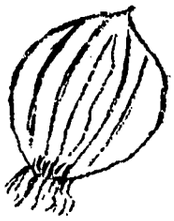
cutting

mold

embryo

Plants -- Worksheet Ideas

1. Tell the word



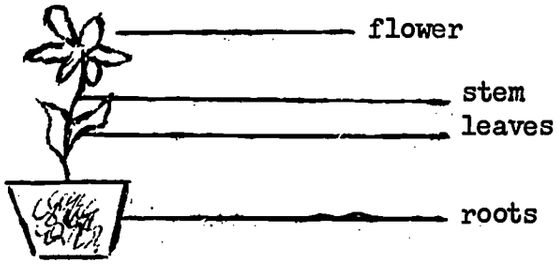
B _ _ B

C _ _ _ _ S

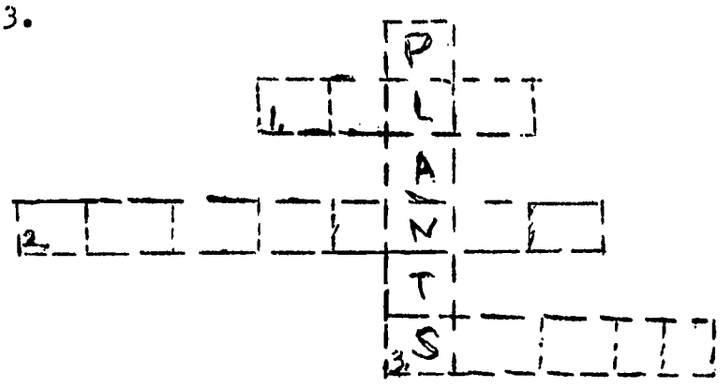
m _ _ D

S _ _ _ m

2. Name the parts



3.



1. An onion is an example of a _____.

2. Plants can grow by making _____.

3. Many green plants grow from _____.

4. Fill in the blanks.

   a. Plants get energy from the _____.

   b. Plants drink water from the _____.

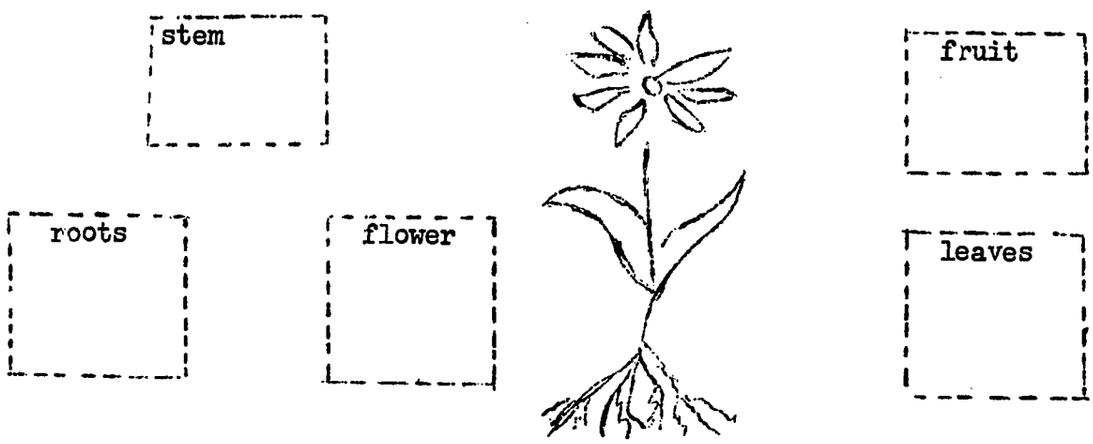
   c. The _____ produce food for man.

   d. Plants need _____, _____, and _____ to grow.

   e. Many plants have flowers or _____.

Bulletin Board Ideas - Plants

Parts of a plant



Bibliography

Teacher's Books

Barnard, J. Darrell. Science For Tomorrow;s World. The Macmillan Company, 1966.

Brandwein, Paul F. Concepts In Science 2. Harcourt, Brace, and World, Inc., 1966

Craig, Gerald S. Science For You. Ginn and Company, 1965.

Jacobson, Willard J. Searching In Science. American Book Company, 1965.

MacCracken, Helen Doman, Science Through Discovery. L. W. Singer, Company, Inc.,1968.

Tannenbaum, Harold E. Adaptations. McGraw-Hill Book Co., 1967.

Tannenbaum, Harold E. Living Things. MacGraw-Hill Book Co., 1967.

Tannenbaum, Harold E. Plants In Spring. McGraw-Hill Book Co., 1967.

Children's Books

Allen, Gertrude E. Everyday Wildflowers. Houghton Mifflin Company, 1965.

Bartlett, Margaret F. Down The Mountain, William R. Scott, Inc., 1963.

Jordan, Helene J. Seeds By Wind and Water. Thomas Y. Crowell Company, 1962.

McFall, Christie. Wonders of Sand. Dodd, Mead & Company, 1966.

Syrocki, B. John. What Is Soil? Benefic Press, 1961.

Webber, Irma E. Travelers All: How Plants Go Places. William R. Scott, Inc., 1944.

Filmstrips

Autumn Is An Adventure	Robin Hood School
Living and Non-Living Things	" " "
Spring Is An Adventure	" " "
We Explore The Woodland	" " "
Plants and Parts	3 - 1 - B8
Plants Grow and Change	3 - 4 - E6
Plants	3 - 5 - A5
Plants and Seeds	3 - 5 - A6

Animals

Animals

A. Background

Children in the second grade have had experience with animals of some kind. They are aware of the great variety of living creatures on the earth.

In this unit the interdependency of animals and plants is stressed. No animal can make its own food; plants must do this.

This unit also stresses the importance of heredity and environment in determining the type animal we find.

Insects, amphibians and reptiles will be examined in depth. Brine shrimp will be dealt with as an example of how animals grow and live. The children can become acquainted with some of the problems of living organisms as they become involved with brine shrimp's daily fight for survival.

B. Concepts

1. All animals depend on food from plants for energy and growth.
2. The food requirements of living things may vary.
3. There are different forms of living things.
4. Living things are products of heredity and environment.
5. Insects have six legs and a body with three parts.
   a. A female moth lays her eggs on a leaf. A caterpillar emerges from the eggs. Each caterpillar eats, grows, and sheds its skin several times. Then, spinning a cocoon of silk around itself, a caterpillar changes into a pupa inside the cocoon. A pupa, undergoing many changes within the cocoon, emerges from it as a moth. New female moths lay eggs to start the life story of her eggs on a leaf.
   b. A female butterfly lays her eggs on a leaf. The eggs hatch a tiny caterpillar emerges from each egg. Each caterpillar eats and grows, shedding its skin several times. After shedding its skin for the last time, a caterpillar changes into a pupa called a chrysalis. A pupa undergoes many changes, finally emerging from the skin of the chrysalis as a butterfly. New female butterflies lay the eggs, beginning the life story of a butterfly over again.

c. Grasshoppers feed on many plants.
Many animals eat grasshoppers.
Grasshopper eggs are laid in the ground in the fall.
Young grasshoppers usually hatch in the spring.
Grasshoppers grow by shedding their skins.
Grasshoppers have two large eyes, three smaller eyes.
Grasshoppers crawl, jump, or fly.
Grasshoppers move their jaws sidewards when eating.
There are several different kinds of grasshoppers.
Young grasshoppers look much like older grasshoppers but are smaller.
Grasshoppers are less active when it is cold.
Grasshoppers can make sounds.

d. Female mosquitos lay their eggs on the surface of the water. Tiny wigglers emerge from the eggs in the water. Wigglers eat and grow, shedding their skins four times. Wigglers then become pupa. In less than a week the skin breaks and a mosquito emerges from the skin of the pupa. The mosquito can now fly and the story begins again.

6. Amphibians live part of their life in water and part on land.

7. Turtles belong to the group of animals known as reptiles.

8. There are many kinds of fish.

9. The brine shrimp is an example of a crustacean.

C. Motivation

1. If this unit is initiated in the fall, a field trip might be taken to capture some grasshoppers.

2. If the unit is initiated in the spring, collect turtle or frog eggs and watch their development.

3. Observe the development of brine shrimp.

4. Make a pictoral display of developmental changes in various organisms.

5. Show a filmstrip on the development of the frog or other animal.

D. Activities

CONCEPT	
All animals depend on food from plants for energy and growth.	Materials: unopened cans of fish Procedure: Allow the class to examine and discuss the cans. Guide the class to the following understandings:

We eat some kinds of fish.

Some fish feed on other fish.

The tiniest fish feed on tiny green plants.

Without green plants there would be nothing for fish to eat.

Present the following problems for discussion:

1. Betty's cat eats only canned tuna. From that Betty's cat depends for its food on green plants that grow in the ocean.

2. Jeff said that he is sure that there must be some sunlight shining on the green plants that grow in the ocean. Agree or disagree. Explain your answer.

Extension

1. Secure, from an aquarium supply store, a jar of water from a tank in which water plants have been growing. Place the jar in a light place, and let children observe it over a period of time, as tiny green water plants multiply and give the water a murky green or brownish-green color. Explain that green plants like these serve as food for tadpoles, fish, and other animals that live in fresh water.

2. Take a field trip to the ocean at low tide. Allow the class to discover the seaweed and other algae in tide pools.

3. Make an aquarium for the classroom.

Display pictures of cows. Allow the class to observe and discuss these pictures. Help the children to recall the different foods we get from cows. Show a picture of a dairy cow. Explain that these cows are often called milk (nilch) cows because they are raised to supply milk. Through discussion lead the children to the following understandings:

Cows eat green plants or dried plants that were once green.

Within a cow's body, green plants are converted to milk.

When we drink milk or eat foods made from milk, we get food that was made in green plants.

Present the following problem for discussion:

What would happen if a cow had plenty of water to drink, but no food to eat? Could it keep on giving milk? Explain your answer.

Extension

1. Make a field trip to a dairy.

2. Collect twenty empty milk cartons. Let the children see how many cartons could be filled by milk from a single dairy cow in a day. Develop the fact that four quarts equal one gallon.

3. Make a chart showing what can be made from five gallons of milk. Use outline drawings or cutouts to represent the approximate quantities of the dairy products listed below:

from five gallons of milk

Evaporated milk	(21 large cans)
American cheese	(4 lbs)
butter	(about 1-3/4 lbs)
dry whole milk	(5 lbs)

4. Make a display using wrappers from different dairy products.

Materials: one hen's egg, bird pictures (one should be a hen)

Procedure: Display the egg. Encourage discussion about it. Show the bird pictures and determine which bird the egg came from.

Review from first grade the following concepts:

Birds have feathers.

They have two legs and two wings.

They lay hard-shelled eggs.

Through discussion let the children express ideas like these:

Some eggs are used to hatch into new chickens.

Some eggs are used as food for us.

Hens get food from plants.

Some of the food is changed in the hen's body to eggs.

Eggs contain food that was made in plants.

When we eat we get food from green plants.

Extension

1. Bring in a fresh egg. Break this carefully into a saucer. Help the children identify the white and yolk. Then located the germ, a very small light spot at the top of the yolk. If this were an egg from which a chick were to grow, the germ would develop into the baby chick. The white and yolk would provide the chick with food.

Conclude by explaining that the eggs we eat could not develop into baby chicks, therefore we can eat as many as we like.

2. Use empty egg cartons to discover that 12 makes a dozen, 6 a half-dozen and several other fractional parts.

3. Watch the development of a baby chick by the use of an incubator.

The food requirements of living things may vary.

There are different forms of living things.

Living things are products of heredity and environment.

Materials: Pictures or a collection of insects

Procedure: Allow the class to observe and discuss the pictures or collection of insects. Help the children to notice the many different types of insects. Explain that insects are just one group of animals. Allow the class to speculate (some may already know)

Insects have six legs and a body with three parts.

as to what these insects eat. Use a magnifying glass to examine these insects closely if at all possible. Guide the children to notice that insects have six legs and three body parts. Conclude by asking the class what these insects would eat if there were not plants to eat.

Extension

1. Make an insect collection.

2. Make a live collection of as many insects as possible. Observe their growth. Some will die. Allow the class to speculate why.

A female moth lays her eggs on a leaf. A caterpillar emerges from the eggs. Each caterpillar eats, grows, and sheds its skin several times. Then, spinning a cocoon of silk around itself, a caterpillar changes into a pupa inside the cocoon. A pupa, undergoing many changes within the cocoon, emerges from it as a moth. New female moths lay eggs to start the life story of her eggs on a leaf.

Materials: caterpillar, cheesecloth, wide-mouth glass jar, leaves of the type the insect was found on, paper and rubber band.

Procedure: Have the children collect caterpillars. Note the different types brought in. Build homes for the caterpillars by placing them in the jars with the cheesecloth and rubber bands on top. Remind the children to bring fresh leaves every day to refill the jar. They should remove all old leaves carefully so that the caterpillar is not pulled off the leaf. Record the number of days the caterpillar eats. If the caterpillar stops eating, the children may note that it either sheds its skin or builds a cocoon. Draw pictures to show what is happening.

Extension

If possible locate a dead moth. Scrape off the "dust" from the wings. These are really tiny colored scales which help give moths and butterflies their colors.

Observe the development of the moth. Record your observations. Guide the children to an understanding of the moth's life story. Note that the children will be able to distinguish a moth from a butterfly by its furry antennae.

A female butterfly lays her eggs on a leaf. The eggs hatch and a tiny caterpillar emerges from the egg. Each caterpillar eats and grows, shedding its skin several times. After shedding its skin for the last time, a caterpillar changes into a pupa called a chrysalis. A pupa undergoes many changes, finally emerging from the skin of the chrysalis as a butterfly. New female butterflies lay the eggs, beginning the life story of a butterfly over again.

Materials: dead butterflies, models or pictures

Allow the class to observe and discuss these. Note the antennae which are slim and long with knobs at the end of each. Note also the tongue, a long tube-like structure, through which it sucks out nectar from flowers.

Help the children to determine the life story of the butterfly by reviewing the life story of the moth.

Extension

Make mobiles of moths and butterflies.

Grasshoppers feed on many plants.

Many animals eat grasshoppers.

Grasshopper eggs are laid in the ground in the fall.

Young grasshoppers usually hatch in the spring.

Grasshoppers grow by shedding their skins.

Grasshoppers have two large eyes, three smaller eyes.

Grasshoppers crawl, jump or fly.

Grasshoppers move their jaws sidewards when eating.

There are several different kinds of grasshoppers

Young grasshoppers look much like older grasshoppers but are smaller.

Materials: Grasshoppers, jars for homes, magnifying glasses

Procedure: Having collected several grasshoppers ahead of time, keep them in jars until ready for use.

Arrange the class in a circle on the floor. Hand out enough magnifying glasses for every two or three people. Allow the class time to observe the grasshopper in the jars. Help them note how the grasshopper climbs the side of the jar. Noticd the strong hind legs are used in jumping. Release the grasshopper in the circle. Some grasshoppers jump ten times their own body height and twenty times their body length. Guide the children to understand the life story of the grasshopper. Many summer animals eat grasshoppers. Their color makes them hard to see in the grass. The children should be able to name other animals that are protected by their coloring.

Extension

1. Find pictures of different kinds of grasshoppers and make a chart of them.

2. Place one jar of grasshoppers in a cool area and keep another jar at room temperature. This will demonstrate that grasshoppers move less when the temperature is reduced.

3. Different species of grasshoppers produce sound in various ways. Some advanced students may be assigned to find out how grasshoppers make sounds.

Female mosquitoes lay their eggs on the surface of the water. Tiny wigglers emerge from the eggs in the water. Wigglers eat and grow, shedding their skins four times. Wigglers then become pupa. In less than a week the skin breaks and a mosquito emerges from the skin of the pupa. The mosquito can now fly and the story begins all over again.

Materials: Pictures of mosquitoes and hopefully some showing their life cycle, several dead mosquitoes, magnifying glass

Procedure: Pass out several mosquitoes and several magnifying glasses. Allow the class time to observe these insects by themselves. When sufficient time has passed, ask the children how they know the mosquito is an insect. Help the children to notice how the mosquito eats. Discuss how mosquitoes spend their lives. Pictures might be helpful at this point. The children should be able to tell how the mosquito can be harmful to man. They may also be able to suggest ways in which we can get rid of mosquitoes.

Extension

1. To show the effect oil on water can produce on wigglers you might try this experiment.

Materials: two glass jars with covers, water with mosquitoes wigglers in it, and some oil.

Procedure: Place some of the wigglers and water in each jar. Look at the jars in the light. Now place some oil in one jar. Observe what happens. The wigglers will suffocate.

Make a large circle with a piece of very light wire. Place this on the ground. Count the number of insects you see. Count the different kinds of insects. Repeat this for several days. Record your findings.

Amphibians live part of their life in water and part on land.

Materials: toad and frog

Procedure: Have one of the children feel the two animals. Determine how they are similar and dissimilar. You might prepare a chart similar to this:

How does it feel?

	Smooth	Rough	Bumpy	Dry	Wet	Slippery
Toad						
Frog						

The question mark indicates that the toad's skin is dry in comparison to the frog's, although both are moist.

Explain that since toads spend most of their lives away from water, they have to depend upon moist soil to dampen their skin so that oxygen from the air will pass through.

Extension

Make a terrarium for the frog and toad. Feed them insects daily.

Ask the children a question such as the following:

How is the frog dependent on green plants? What would happen if there were no green plants to eat? Explain your answer.

Materials: frog and, or toad eggs, tadpoles

Procedure: Allow the children to observe the eggs for a short period of time. Note that the toad eggs are laid in a string, whereas frog eggs are laid in a mass. Both eggs hatch in the water into tadpoles. They both gradually become frogs or toads. Toads will live on land away from water most of their lives, whereas frogs will live near water after they change from tadpoles. Draw pictures of the different stages you see.

Extension

If the eggs can be kept long enough, observe their development into tadpoles. Record what you see.

Turtles belong to the group of animals known as reptiles.

Materials: turtle food, lettuce, meat terrarium, turtle and worms

Procedure: Allow the class to observe the turtle. Help them note the way the turtle moves, the hardness of the shell, the claws and its tail.

Do not feed the turtle for several days prior to the lesson. Then supply it with a few pieces of food. The class will discover that the turtle will probably eat a variety of food. Determine which type your turtle likes best. Keep the turtle in a terrarium and observe its habits. Explain that the turtle belongs to the reptile family. Other reptiles are snakes, lizards, and alligators.

Extension

Make a chart showing various reptiles that the children know.

Materials: Pictures of a turtle's life story.

Procedure: Ask the class to tell as much about the pictures as possible. Help them to note that the female turtle lays in soil near water. First, she digs a hole with her back feet, then she lays the eggs. She covers them with soil and walks away. The sun warms the soil and the eggs. When the little turtles have grown large enough, they hatch, looking very much like their parents. They then come out of the soil and look for food. Compare this with the development of the frog and an insect.

Extension

Draw pictures showing the development of a turtle.

There are many kinds of fish.

Materials: An aquarium with fish and plants

Procedure: One of the children will probably have an aquarium at home which he will be able to bring in. Help the class to observe the things that are in the aquarium. They should understand that plants are necessary to clear the

water and provide a place for fish to hide. Note how the fish move. Their fins are very important. The children should see that the eyes do not close, thus it is difficult to tell when a fish is asleep. Explain also that the mouth and gill covers enable the fish to take water into its mouth. The water, which contains air, passes from the mouth over the gills. Oxygen is absorbed into the bloodstream through the gills. Note what your fish eats. How are they dependent on green plants?

Extension

1. Show the filmstrip, "How Fish Get Their Food." (3 - 1 - E3)

2. Some children may be able to do research to find out how fish reproduce.

The brine shrimp is an example of a crustacean.

Materials: brine shrimp eggs - one or two vials, 3 lbs. marine salt (about four cups,)30 containers (one for each child) - clear plastic or glass, 30 hand lenses (4x10) 30 plastic spoons, crayons, paper, masking tape. These may be obtained from any pet store or ordered from Ward's Natural Science Establishment, Inc., P.O. Box 1712, Rochester, New York, 14603. Order two 27 ounce packages @ $1.95, catalogue number 21W7353.

For additional information refer to Brine Shrimp published by the Elementary Science Study of Education, Development Center, Inc., 55 Chapel Street, Newton, Mass. 02160. This pamphlet is available through Miss Mayo's office.

Procedure: Sprinkle some eggs on the paper and allow each child to look at the eggs with a hand lens. Let the class speculate as to what they see. Pass around a jar with the marine salt and allow the children to guess at what it is. Explain that this helps the eggs hatch. A tablespoon of salt to a cup of water should produce live brine shrimp. Only a few eggs are needed and the water should be replenished frequently so that the salt concentration

does not become too strong. Salt water algae and bacteria are the natural food of the brine shrimp. You may add food yourself such as powdered dry yeast. Watch the development of the brine shrimp and record what you see.

Extension

1. Set up single jars with amounts of salt differing from that originally suggested.

2. Set up two jars; one with 1 teaspoon of salt, one with 8.

3. Set up two jars; one with 1 teaspoon, one with none.

4. Set up ten jars; each with 1 more teaspoon of salt than the preceding one.

Animals

Vocabulary

salmon
sardine
tuna
schools
fish
Holstein
Jersey
Guernsey
udder
milk
butterfat
butter
hen
chicken
rooster
comb
butterfly
chrysalis
nectar
caterpillar
insect
pupa
grasshopper
antennae
moth
nose
legs
turtle
amphibian
reptile
frog
toad
mosquito
wiggler
aquarium
terrarium
brine shrimp

Animals - Worksheet Ideas

1. Word-Recognition Game.

   On cards, print the name of various adult and immature animals, one word to a card. Call on individual to "Find the parent" or "Find the Young" - placing the cards together in pairs. Here are some words to use:

cow - calf	cat - kitten
hen - chick	butterfly - caterpillar
dog - puppy	ladybug - grub
spider - spiderling	sheep - lamb

2. If the sentence is true write yes, if it is false write no.

   a. All animals must eat.
   b. All animals make their own food.
   c. Animals depend on plants for food.
   d. All animals live in the ground.
   e. All animals are insects.

3. Fill in the blanks.

   a. The grasshopper has wings and six jointed legs. The grasshopper is an _____.

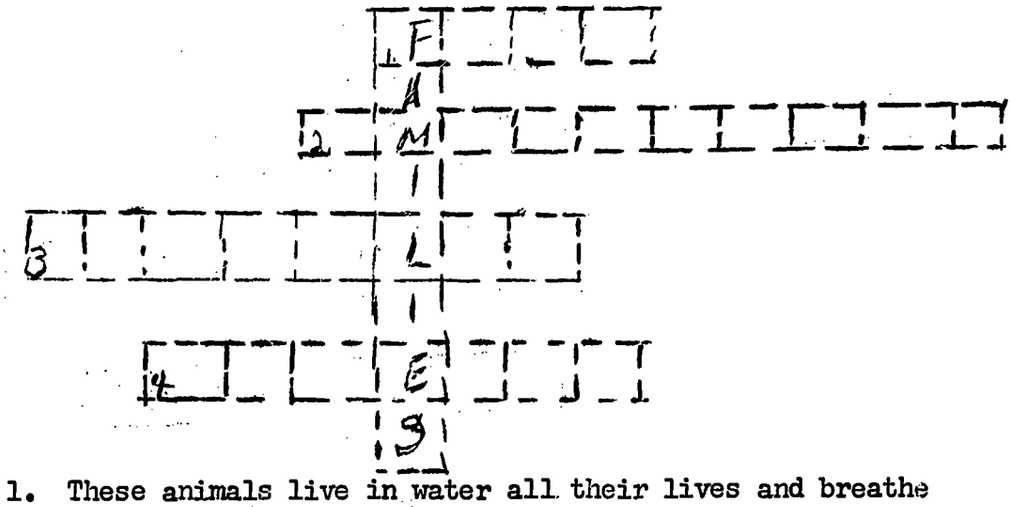
   b. Frogs and toads belong to the group of animals called _____.

   c. An _____ has six legs and three body parts.

   d. Fish breathe through _____.

   e. A turtle is a _____.

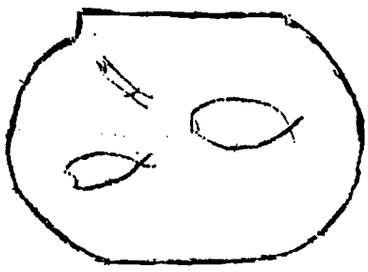
4.



   1. These animals live in water all their lives and breathe through gills.
   2. The frog belongs to this family.
   3. Turtles and alligators belong to this family.
   4. All these animals have two antennae and six legs.

Bulletin Board Ideas - Animals

If You were a Fish, how would you

hear	see	eat		reproduce
sleep	smell	digest		breathe

Bibliography

Teacher's Books

Brandwein, Paul F. Concepts In Science. Harcourt, Brace & World, Inc., 1966.

Farb, Peter, and the Editors of Life. The Insects. Time, Inc., 1962.

Hegner, Robert. Parade of the Animal Kingdom. The MacMillan Co., 1966.

Hone, Elizabeth B., Joseph, Alexander and Victor, Edward. A Sourcebook For Elementary Science. Harcourt, Brace & World, Inc., 1962.

Mac Cracken, Helen Dolman. Science Through Discovery. L. W. Singer Co., Inc., 1968.

Metcalfe, C. L. Destructive and Useful Insects. McGraw-Hill Book Company, Inc., 1951.

Novak, Joseph D. The Exciting World of Science. Bobbs, Merrill Col, Inc., 1966.

Otto, James H. and Towle, Albert. Modern Biology. Holt, Rinehart and Winston, Inc., 1965.

Schneider, Herman and Nina. Science For Here and Now. D. C. Heath and Company, 1965.

Silvan, James. Raising Laboratory Animals. The Natural History Press, 1966.

Storer, Tracey L., and Usinger, Robert I. General Zoology. McGraw-Hill Book Company, Inc., 1965.

Thurber, Walter A. Exploring Science Two. Allyn and Bacon, Inc., 1966.

Zim, Herbert S. and Cattam, Clarence. Insects. Golden Press, Inc., 1956.

Zim, Herbert S. and Smith, Hobart M. Reptiles and Amphibians. Simon and Schuster, Inc.,1965.

Brine Shrimp, Elementary Science Study. 1968 Education Development Center, Inc.

Children's Books

Dugan, William. The Bug Book. Golden Press, Inc., 1965.

Earle, Olive L. Crickets. William Morrow and Company, Inc., 1956.

(Bibliography continued)

Eberle, Irmengarde. A Chipmunk Lives Here. Doubleday & Company, Inc., 1966.

Eberle, Irmengarde, and Scott, Myron E. Robins On The Window Sill. Thomas Y. Browell Company, 1963.

Coudey, Alice B. Here Come The Bees! Charles Scribner's Sons, 1960.

Hogner, Dorothy Childs. Butterflies. Thomas Y Crowell Company, 1962.

Marcher, Marion W. Monarch Batter Fly. Holiday House, Inc., 1954.

McClung, Robert M. Bufo: The Story Of A Toad. William Morrow and Company, Inc., 1954.

Reich, Hanns. Baby Animals and Their Mothers. Hill and Wang, Inc., 1965.

Sears, Paul M. Firefly. Holiday House, Inc., 1956.

Selsam, Millicent. All About Eggs. William R. Scott, Inc., 1952.

Sterling, Dorothy. Caterpillars. Doubleday & Company, Inc., 1961.

Tee-Van, Helen Damroach. Insects Are Where You Find Them. Alfred E. Knopf, Inc., 1963.

Zim, Herbert S. Frogs and Toads. William Morrow and Company, Inc., 1950.

Filmstrips

Farmyard Babies	Robin Hood School
How Animals Live In Water	Robin Hood School
The Brook	1 - 6 - E1
Looking For Animals	3 - 1 - D1
Reptiles	3 - 1 - D3
Cows	3 - 1 - D4
Fish	3 - 1 - D5
Cats	3 - 1 - D6

(Filmstrips continued)

Snakes	3 - 1 - D8
Woody Woodpecker	1 - 5 - C1
Rudy and Trudy Bear	1 - 5 - C2
Needles Porcupine	1 - 5 - C3
How Amphibians Get Their Food	3 - 1 - E2
The Turtles	1 - 5 - E4
Animals Of The Pond	3 - 1 - B3
Just Animals	3 - 4 - E4
Animals Grow and Change	3 - 4 - E5
How Animals Live	3 - 5 - A4

A Long Time Ago

A LONG TIME AGO

A. Background

The earth has changed over the millions of years of its existence and will continue to change as long as it exists. Every child has heard about the great animals called dinosaurs which once roamed our planet. Some children have seen fossils left behind as a reminder of a previous existence. Many fossils show animals which only vaguely resemble animals that we know today. Changes have occurred over the millions of years because of environment and heredity. In this unit we hope to learn something about our earth's past and how we got to where we are.

B. Concepts

1. Organisms have changed over the years.
2. Organisms are products of heredity and environment.
3. The earth has changed over the years.
4. Changes in the environment affect the life, growth and development of other organisms.

C. Motivation

1. Show filmstrips:

   Animals of Long Ago
   Our Changing Earth

2. Make a display of fossils.
3. Make a display of dinosaurs.

D. Activities

CONCEPT	EXPERIENCES
Organisms have changed over the years.	Materials: examples of fossils.
Organisms are products of heredity and environment.	Procedure: Decide how fossils look as compared with plants and animals today. Where are fossils found? What are they made of? Ask the class to look for pictures that might show how the world looked millions of years ago.

EXTENSION

1. Make clay fossil imprints and label them.

2. Show the class pictures of the coal age. Decide how it differs from the earth today. Use this opportunity to explain the derivation of the term "Coal Age."

EXTENSION

Make dioramas of the Coal Age. Use a shoe box with part of the bottom removed and replaced with blue tissue paper. Have the children fill in the plants, animals and background.

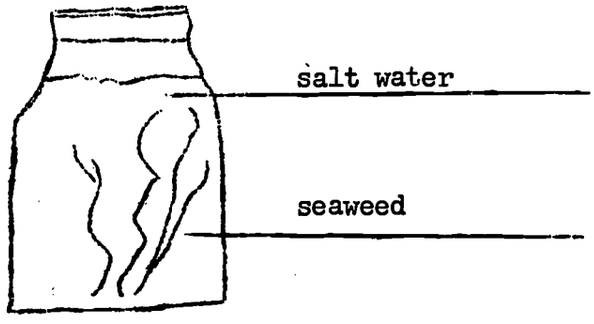
The earth has changed over the years.

Materials: seaweed

Procedure: Collect seaweed and examine the pieces. Since life began in the ocean, discuss what the first plants should have looked like. Assign someone to go to the library and find a book showing what life looked like then.

EXTENSION

Make a seaweed garden. Place in a jar of fresh or salt water pieces of seaweed, pebbles, clean sand and shells. Cover the jar securely with a screw cap.



Changes in environment affect the life and growth of organisms.

Materials: Show pictures of fish.

Procedure: Discuss how fish breathe through gills. Explain that the first fish were forced to move out of the water as the lakes and ponds began to dry up. They grew bones and muscles in their fins which helped them move on land. They also developed lungs. What might these fish have been looking for? (Food and air.) Could they move quickly? Explain that these fish probably didn't go too far from the water, as water was probably needed to keep their bodies wet and cool. They laid their eggs in water and were probably the first land animals. Discuss whether dinosaurs came after or before these fish.

Materials: a flower of any kind, a fern or mature fern frond, and a magnifying glass.

Procedure: Review with class that seeds are made in flowers. Discuss how flowering plants begin. They begin in seeds. Hold up the fern and ask what it is. Explain that ferns never make seeds or have flowers. Show the fern fronds (fern leaves.) On the underside should be small brown or yellow dots. These "cases" are filled with spores. These fall to the ground when ripe and can be seen only with a microscope. They grow in the warmth and moisture of the ground. How is a spore like a seed? (A new plant can grow from it.)

Materials: salamander.

Prodedure: Explain that as a salamander lays its eggs in water, these eggs hatch into babies with lungs. As they grow older, they form lungs and move to land. Explain that the first land animals that developed after the Coal Age probably looked a lot like the salamander but were much bigger. These were the first amphibians. Frogs and toads are two other amphibians.

Materials: a turtle

Procedure: Write the word reptile on the board. Explain that they lay eggs with thick, tough shells on land. The babies that hatch look like their parents. The first reptiles probably' came at the end of the Coal Age as the land was cooling off and becoming drier. Ponds were beginning to disappear and the plants that had previously thrived were drying out. Deserts were forming. This was the Age of Reptiles. This was the era of the dinosaur. Compare pictures or models of dinosaurs which are in the class with the turtle. Discuss how the two reptiles differ. How are they alike?

Materials: a dead dragon fly

Procedure: Ask someone to measure the wings. Explain that during the Coal Age the dragon fly had wings that were two feet across. Have someone measure the distance on the board. Cockroaches were the size of mice. We find these insects as fossils today. Observe the similarities and differences of the dragon fly of the Coal Age and today's dragon fly. Eggs are laid on water - Nymphs (six-legged creatures that breathe through gills) emerge. After approximately a year of water life, they change into adult dragonflies. It climbs the stem of a water plant, the skin splits, and the adult insect emerges and dries its wings.

EXTENSION

1. Make pictures of lungfish that lived in the Coal Age.

2. Write stories about "The Fish That Walked."

3. Bring a backbone from a fish. Place this in salt water and have the class examine it. Relate this to the lungfish.

4. Make a terrarium. You will need a few pieces of charcoal on the bottom. Cover this with sand and then a layer of damp woodland soil or leaf mold. Mold this to form a hill at one end and a pool at the other. Use an aluminum foil pan for the pool. Rim the pan with rocks and pebbles that make the pond look natural. Add tiny ferns, baby tears, wandering jew or other small shade plants, from the backyard. Add lichen-covered bark and several small pieces of rotting wood. Place a sheet of glass, taped on all sides for safety, on top of the terrarium. No watering should be necessary as the dampness from the plants and soil will condense on the sides and tops of the terrarium.

5. Make an environment a turtle could live in. You will need a wide, shallow container. Make a pond in one part by using a shallow glass or pottery bowl among rocks and sand. Make some "caves" from rocks or wood for protection from heat.

6. The Peabody Museum at Harvard University has an excellent display of pre-historic animals. This would make an excellent field trip.

Vocabulary List - A Long Time Ago

Coal Age

swamp

reptile

fossil

lungfish

backbone

gills

lungs

spore

spore case

fern, frond

amphibian

salamander

toad

tadpole

frog

dinosaur

turtle

cockroach

dragonfly

nymph

Worksheet Ideas - Long Ago

1. Fill in the Missing Letters.

a.	din_sau_	f.	ro_tile
b.	fos_il	g.	l_ngfi_h
c.	Co_l A_e	h.	tur_le
d.	back_one	i.	br_ath
e.	dra_onfl_	j.	se_we_d

2. Cross out the word that doesn't belong.

   a. A dragonfly is an insect reptile.

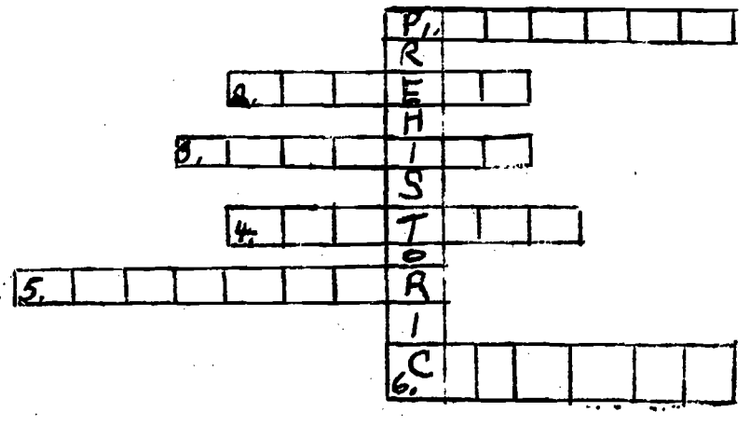
   b. The lungfish learned to breathe on land through gills lungs.

   c. A turtle is a reptile insect.

   d. A baby dragonfly does does not look like its parents.

   e. The earth has has not changed over many years.

3.



   1. When we say wood is as hard as stone we use this word.

   2. One of the first animals was probably one of these.

   3. Imprints of animals from long ago are called this.

   4. This animal lived during the Coal Age.

   5. These were the largest of the prehistoric animals.

   6. The lungfish first came to land at this time.

BIBLIOGRAPHY

Teacher's Books

Barnard, J. Darrell - Science For Tomorrow's World, MacMillan Company, 1966

Barnet, L. - The World We Live In, Simon and Schuster, 1956

Brandwein, Paul F. - Concepts In Science 2, Harcourt, Brace & World, Inc., 1966

Jacobson, Willard J. - Prehistoric Plants and Animals, American Book Company, 1968

MacCracken, Helen Dolman - Science Through Discovery 2, L.W. Singer Co.,Inc., 1968

Schneider, Herman and Nina - Science For Today and Tomorrow 6, D.C. Heath and Co.,1968

Children's Books

Ballard, Lois - True Book of Reptiles, Children's Press, Inc., 1962

Frost, Bruno - A Child's Book of Prehistoric Animals, Maxton Publishing Corp., 1956

Holgart, Eunice - Dinosaurs, Holt, Rinehart and Winston, Inc., 1959

Kramer, Bettina Leonard - About Big Beasts, Melmont Publishers, Inc., 1963

Swinton, William E. - Digging For Dinosaurs, Doubleday and Co., Inc., 1964

FILMSTRIPS

Animals of Long Ago

Our Changing Earth - Encyclopedia Britanica

Discovering Fossils - " "

How Rocks Are Formed - Jim Handy Organization

How We Think Our Earth Came To Be - Jim Handy Organization

Man of Long Ago - Curriculum Materials Corp.